CLAIMS

1. Steroidal compounds or their salts having the following general formulas (I) and (II):

$$A—(B)_{b0}—C\text{-}N(O)_s \qquad (I)$$

wherein:

s = is an integer equal to 1 or 2, preferably s = 2;

b0 = 0 or 1;

A = R—, wherein R is the steroidal drug radical as defined hereunder,

B = $-T_B—X_2—T_{BI}-$ wherein

T_B and T_{BI} are equal or different;

T_B= (CO) when the reactive function in the precursor steroid is -OH; T_B = X when the reactive function in the precursor steroid is -COOH;

X = O, S, NR_{1C}, R_{1C} is H or a linear or branched alkyl having from 1 to 5 crbon atoms, or a free valence;

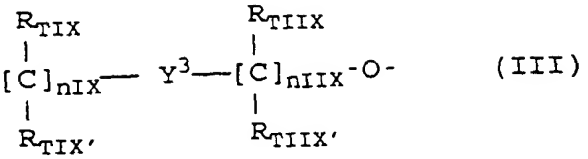
T_{BI} = $(CO)_{tx}$ or $(X)_{txx}$, wherein tx and txx have the value of 0 or 1; with the proviso that tx = 1 when txx = 0, tx = 0 when txx = 1; X is as above defined;

X_2 is a bivalent bridging group as defined hereunder;

C is the bivalent radical $-T_C-Y-$ wherein

T_C = (CO) when tx = 0, T_C = X when txx = 0, X being as above defined;

Y is:



(III)

wherein:

nIX is an integer between 0 and 3, preferably 1;

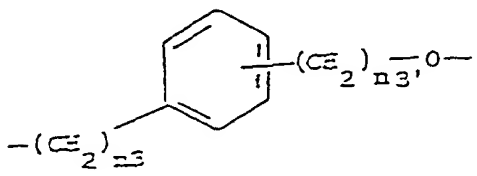
nIIX is an integer between 1 and 3, preferably 1;

R_{TIX}, $R_{TIX'}$, R_{TIIX}, $R_{TIIX'}$, equal to or different from each other are H or a linear or branched C_1-C_4 alkyl; preferably R_{TIX}, $R_{TIX'}$, R_{TIIX}, $R_{TIIX'}$ are H.

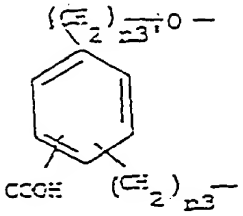
Y^3 is a saturated, unsaturated or aromatic heterocyclic ring containing at least one nitrogen atom, said ring having 5 or 6 atoms,

or Y is Y_0, selected from the following:

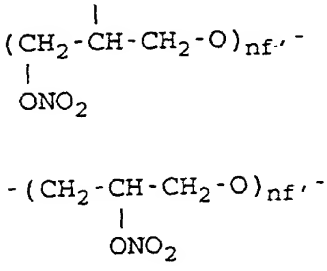
- an alkylenoxy group R'O wherein R' is linear or when possible branched C_1-C_{20}, preferably having from 1 to 6 carbon atoms, or a cycloalkylene having from 5 to 7 carbon atoms, in the cycloalkylenic ring one or more carbon atoms can be substituted by heteroatoms, the ring can have side chains of R' type, R' being as above defined; or



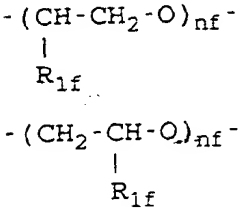
wherein n3 is an integer from 0 to 3 and n3' is an integer from 1 to 3;



wherein n3 and n3' have the above mentioned meaning

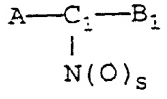


wherein nf' is an integer from 1 to 6 preferably from 1 to 4;



wherein R_{1f} = H, CH_3 and nf is an integer from 1 to 6; preferably from 1 to 4;

preferably Y = $-Y_0$ = R'O- wherein R' is as above defined; preferably R' is a C_1-C_6 alkyl;



(II)

wherein:

C_1 = $-T_{CI}-Y'(-T_{CII}-)$

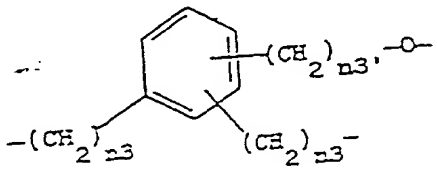
wherein T_{CI} and T_{CII} are equal or different,

T_{CI}= (CO) when the reactive function of the precursor steroid is -OH, T_{CI} = X when the reactive function of the precursor steroid is -COOH, X being as above defined;

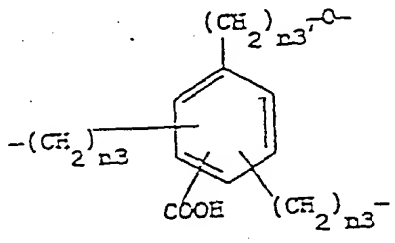
T_{CII}= $(CO)_{tI}$ or $(X)_{tII}$, wherein tI and tII have the 0 or 1 value; with the proviso that tI = 1 when tII = 0; tI = 0 when tII = 1; X is as above defined;

Y' is as Y above defined, but with three free valences instead of two, preferably selected from the following:

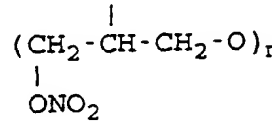
- a $-R'(-)O-$ group wherein R' is C_1-$_{20}$ linear or branched, preferably having from 1 to 6 carbon atoms, or a saturated ring having from 5 to 7 carbon atoms, optionally substituted; or



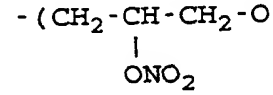
wherein n3 is an integer from 0 to 3 and n3' is an integer from 1 to 3;



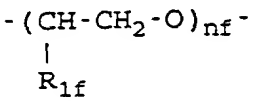
wherein n3 and n3' have the above mentioned meaning;



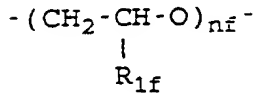
wherein one hydrogen atom on one of the carbon atoms is substituted by a free valence;



wherein nf' is an integer from 1 to 6 preferably from 1 to 4; wherein one hydrogen atom on one of the carbon atoms is substituted by a free valence;



wherein one hydrogen atom on one of the carbon atoms is substituted by a free valence;



wherein R_{1f} = H, CH_3 and nf is an integer from 1 to 6; preferably from 1 to 4; wherein one hydrogen atom on one of the carbon atoms is substituted by a free valence;

preferably Y' = - R'O- wherein R' is a linear or branched C_2-C_4, the oxygen which in Y' is covalently linked to the $-N(O)_s$ group finds at the end of the free bond indicated in C_1 formula;

or Y' = Y_0 as defined in (I) but with three free

valences instead of 2;

$B_1 = -T_{BII}—X_{2a}$

wherein X_{2a} is a monovalent radical,

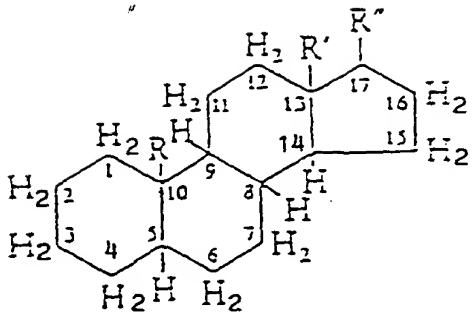
T_{BII} = (CO) when tI = 0, T_{BII} = X when tII = 0, X being as above defined;

X_2, bivalent radical is such that the corresponding B precursor: $-T_B—X_2—T_{BI}-$ meets test 4 or test 5, precursor in which the T_B and T_{BI} free valences are each saturated with OZ, with Z or with $-Z^I-N(-Z^{II})-$, Z^I and Z^{II} being equal or different and have the Z values as above defined, depending on whether T_B and/or T_{BI} = CO or X, in connection with the values of t, t', tx and txx;

the C precursor when b0 = 0 is of $-T_C-Y-H$ type wherein the T_C free valence is saturated with OZ, Z, or with $-Z^I-N(-Z^{II})-$, Z^I and Z^{II} being as above defined, meets test 5;

X_{2a} monovalent radical, such that the corresponding precursor of B_1 $-T_{BII}—X_{2a}$ meets test 4 or test 5, precursor wherein the T_{BII} free valence is saturated with OZ or with Z or with $-Z^I-N(-Z^{II})-$, Z^I and Z^{II} being equal or different and having the Z values as above defined, depending on whether T_{BII} = CO or X, in connection with the tI and tII values;

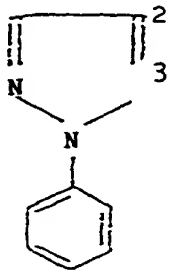
A = R– has the following structure:



wherein in substitution of the hydrogens of the CH groups or of the two hydrogens of the CH_2 groups mentioned in the general formula, the following substituents can be present:

in position 1-2: there may be a double bond;

in position 2-3: there may be the following substituent:



in position 2: there may be Cl, Br;

in position 3: there may be CO, -O-CH_2-CH_2-Cl, OH;

in position 3-4: there may be a double bond;

in position 4-5: there may be a double bond;

in position 5-6: there may be a double bond;

in position 5-10: there may be a double bond;

in position 6: there may be Cl, F, CH_3, -CHO;

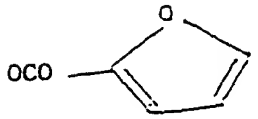
in position 7: there may be Cl, OH;

in position 9: thre may be Cl, F;

in position 11: there may be OH, CO, Cl, CH_3;

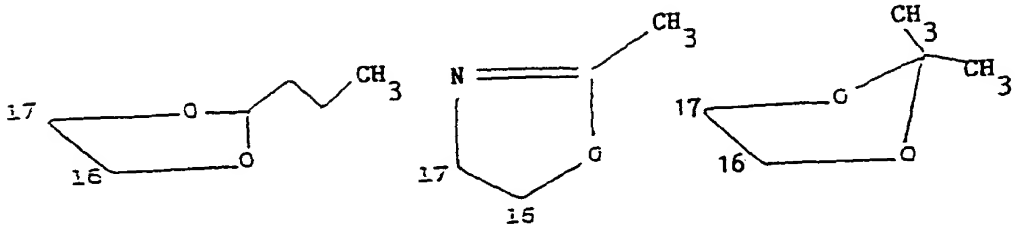
in position 16: there may be CH_3, OH, $=CH_2$:

in position 17: there may be OH, CH_3, $OCO(O)_{ua}(CH_2)_{va}CH_3$, C≡CH or



wherein ua is an integer equal to 0 or 1, va is an integer from 0 to 4;

in position 16-17: there may be the following groups:



R and R', equal to or different from each other, can be hydrogen or linear or branched alkyls from 1 to 4 carbon atoms, preferably R = R' = CH_3;

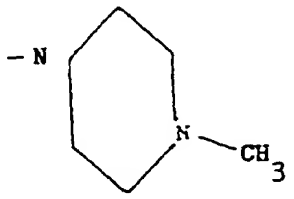
R" is $-(CO-L)_t-(L)_{t2}-(X_O^I)_{t1}-$

wherein t, t1 and t2 are integers equal to or different from each other, equal to 0 or 1, with the proviso that when t = 0 t2 = 1 and when t = 1 t2 = 0, and that t and t1, or t2 and t1, cannot contemporaneously be equal to 0 when A does not contain -OH groups;

the bivalent bridging group L is selected from:

$(CR_4R_5)_{na}(O)_{nb}(CR_4R_5)_{n'a}(CO)_{n'b}(O)_{n''b}(CO)_{n'''b}(CR_4R_5)_{n''a}$

wherein na, n'a, and n''a, equal to or different from each other, are integers from 0 to 6, preferably 1-3; nb, n'b, n''b and n'''b, equal to or different from each other, are integers equal to 0 or 1; R_4, R_5, equal to or different from each other, are selected from H, linear or branched alkyl from 1 to 5 carbon atoms, preferably from 1 to 3; X_0^I is X as above defined, but R_{1c} is a linear or branched alkyl from 1 to 10 carbon atoms, or equal to X_2^I wherein X_2^I is equal to OH, CH_3, Cl, $N(-CH_2-CH_3)_2$, SCH_2F, SH, or



wherein test 4, which must be met by the precursors of B or B_1 with the free valences saturated as above defined, is the following: it is an analytical determination carried out by adding portions of methanol solutions of the precursor of B or B_1 at a 10^{-4} M concentration, to a methanol solution of DPPH (2,2-diphenyl-1-picryl hydrazyl - free radical); after having maintained the solution at room temperature away from light for 30 minutes, it is read the absorbance at the wave length of 517 nm of the test solution and of a solution containing only DPPH in the same amount as in the

test solution; and then the inhibition induced by the precursor towards radical production by DPPH is calculated as a percentage by means of the following formula:

$$(1 - A_s/A_c)X100$$

wherein A_s and A_c are respectively the absorbance values of the solution containing the test compound + DPPH and that of the solution containing only DPPH; test 4 is met by B or B_1 precursor compounds if the % inhibition as above defined is higher than or equal to 50%;

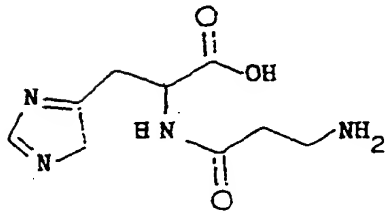
wherein test 5 is an analytical determination carried out by adding aliquots of 10^{-4} M methanol solutions of the precursor of B or B_1 or of C = $-T_C$-Y-H, having the free valence saturated as above indicated, to a solution formed by admixing a 2 mM solution of desoxyribose in water with 100 mM of phosphate buffer and 1 mM of the salt $Fe^{++}(NH_4)_2(SO_4)_2$; after having thermostatted the solution at 37°C for one hour, aliquots of aqueous solutions of trichloroacetic acid 2.8% and of thiobarbituric acid 0.5 M are added, in the order, heating is effected at 100°C for 15 minutes and the absorbance of the tested solutions is then read at 532 nm; the inhibition induced by the precursor of B or B_1 or C = $-T_C$-Y-H with respect to radical production by Fe^{II} is calculated as a percentage by means of the following formula:

$$(1 - A_s/A_c)X100$$

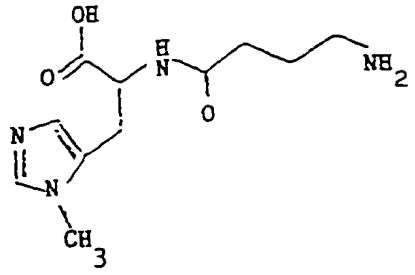
wherein A_s and A_c are respectively the absorbance values of the solution containing the tested compound and the iron salt and that of the solution containing only the iron salt, the compound meets test 5 when the inhibition percentage as above defined of the precursor of B or B_1 or C = $-T_c-Y-H$ is higher than or equal to 50%; provided that in the compounds of formula (I) are excluded the drugs with A = R- when b_0 = 0 and C = $-T_c-Y_0-$ wherein the free valence of Y_0 is saturated as indicated above, s = 1 or 2.

2. Compounds according to claim 1, wherein the precursor compound of B or B_1 which meets test 4, is selected in the following classes:

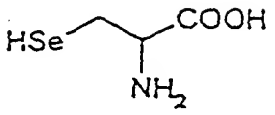
- Aminoacids, selected from the following: L-carnosine (formula CI), anserine (CII), selenocysteine (CIII), selenomethionine (CIV), penicillamine (CV), N-acetyl-penicillamine (CVI), cysteine (CVII), N-acetyl-cysteine (CVIII), glutathione (CIX) or its esters, preferably ethyl or isopropyl ester:



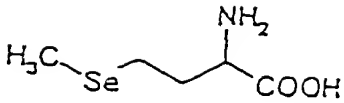
(CI)



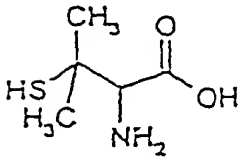
(CII)



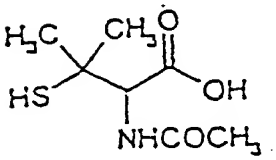
(CIII)



(CIV)



(CV)



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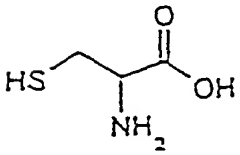

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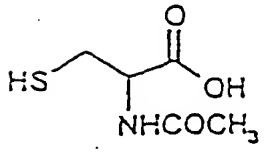

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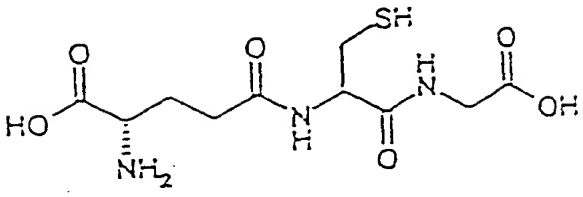
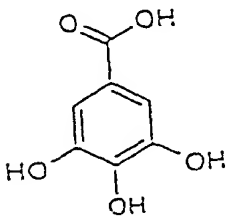
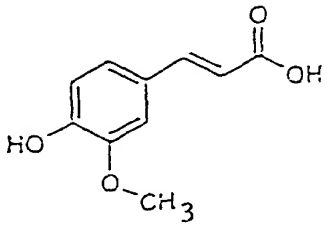


(CIX)

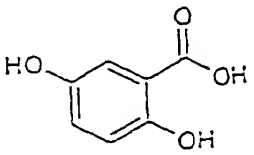
- hydroxyacids, selected from the following: gallic acid (formula DI), ferulic acid (DII), gentisic acid (DIII), citric acid (DIV), caffeic acid (DV), hydro caffeic acid (DVI), p-coumaric acid (DVII), vanillic acid (DVIII), chlorogenic acid (DIX), kynurenic acid (DX), syringic acid (DXI):



(DI)



(DII)



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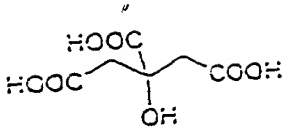
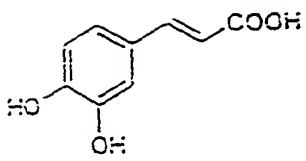
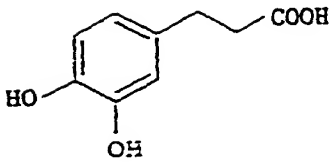


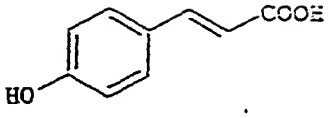
(DIV)



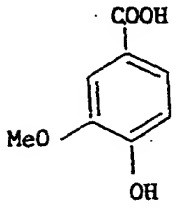
(DV)



(DVI)



(DVII)



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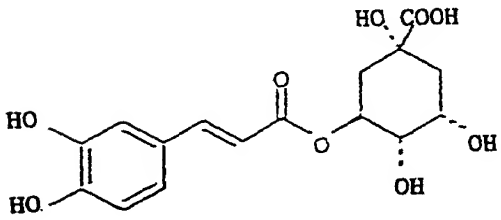
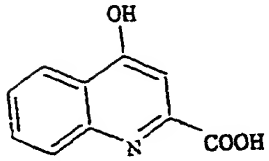
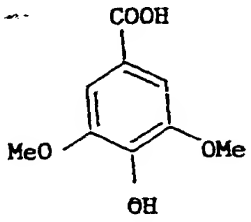


(DIX)



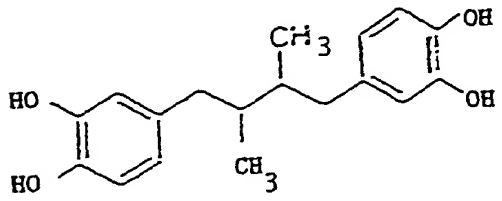
(DX)



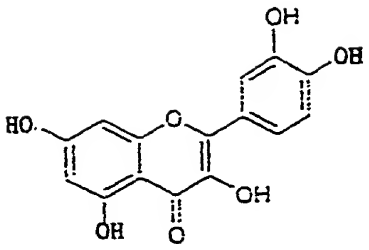
(DXI)

Aromatic and heterocyclic mono- and polyalcohols, selected from the following: nordihydroguaiaretic

acid (EI)„ quercetin (EII), catechin (EIII), kaempferol (EIV), sulphurethyne (EV), ascorbic acid (EVI), isoascorbic acid (EVII), hydroquinone (EVIII), gossypol (EIX), reductic acid (EX), methoxyhydroquinone (EXI), hydroxyhydroquinone (EXII), propyl gallate (EXIII), saccharose (EXIV), vitamin E (EXV), vitamin A (EXVI), 8-quinolol (EXVII), 3-tert-butyl-4-hydroxyanisole (EXVIII), 3-hydroxyflavone (EXIX), 3,5-tert-butyl-p-hydroxytoluene (EXX), p-tert-butyl phenol (EXXI), timolol (EXXII), xibornol (EXXIII), 3,5-di-ter-butyl-4-hydroxybenzyl-thioglycolate (EXXIV), 4'-hydroxybutyranilide (EXXV), guaiacol (EXXVI), tocol (EXXVII), isoeugenol (EXXVIII), eugenol (EXXIX), piperonyl alcohol (EXXX), allopurinol (EXXXI), conyferyl alcohol (EXXXII), 4-hydroxyphenetyl alcohol (EXXXIII), p-coumaric alcohol (EXXXIV), curcumin (EXXXV):



(EI)



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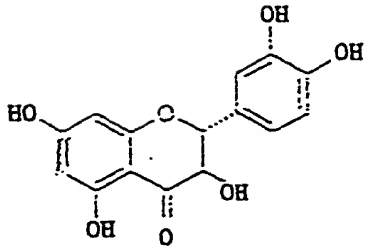
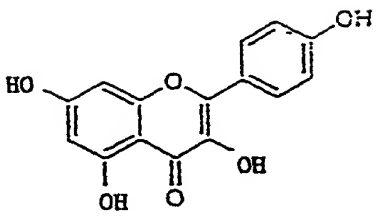
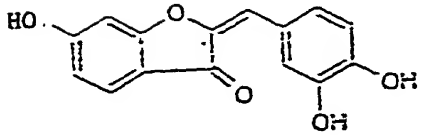


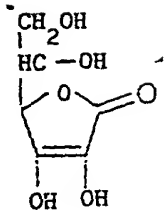
(EIII)



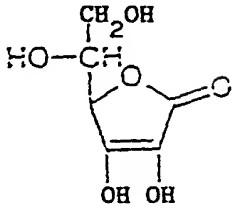
(EIV)



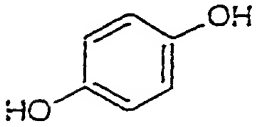
(EV)



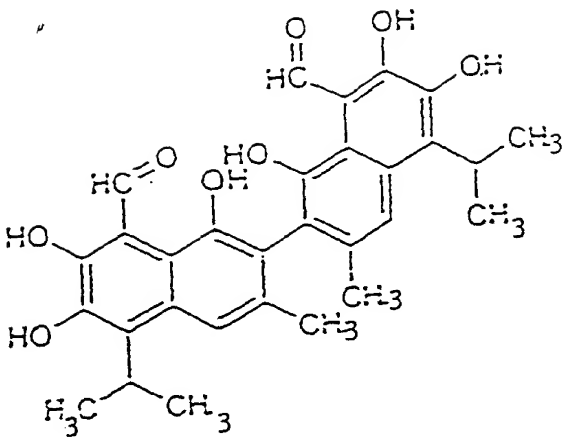
(EVI)



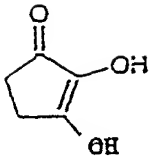
(EVII)



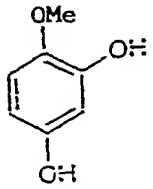
(EVIII)



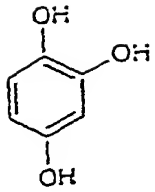
(EIX)



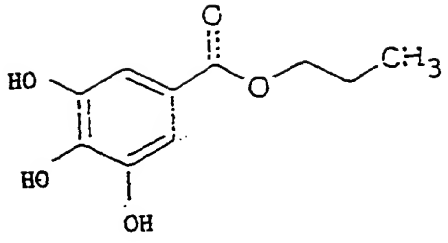
(EX)



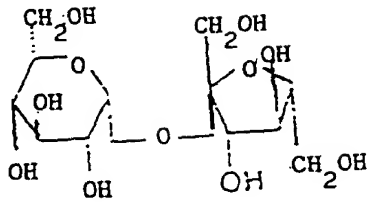
(EXI)



(EXII)



(EXIII)



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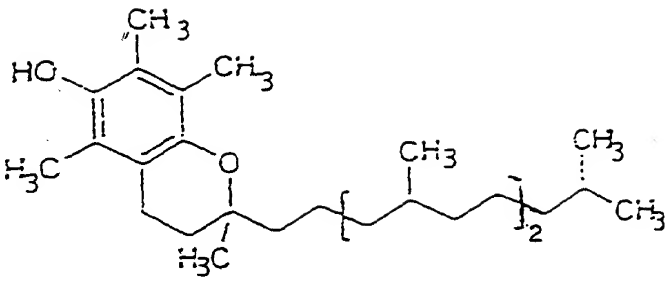
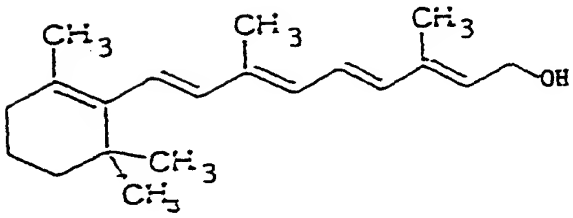
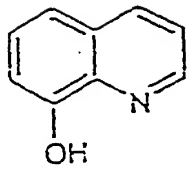


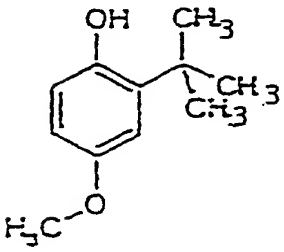
(EXV)



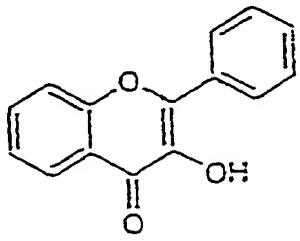
(EXVI)



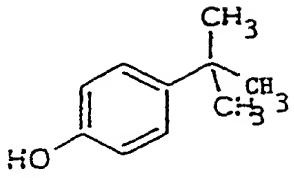
(EXVII)



(EXVIII)



(EXIX)



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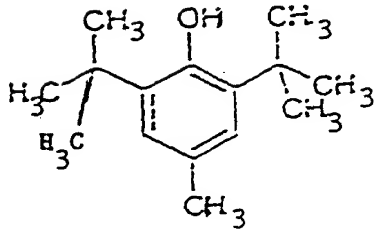

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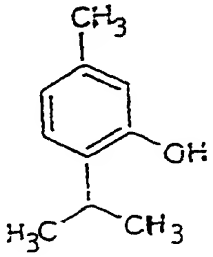

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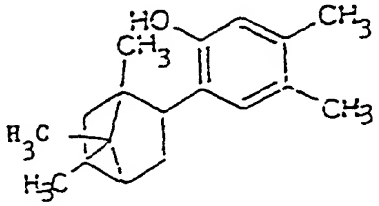

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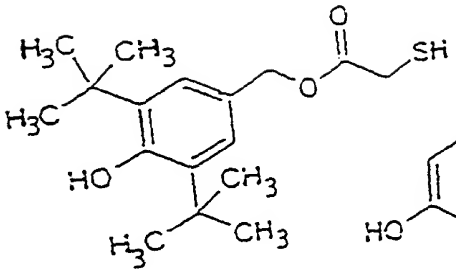

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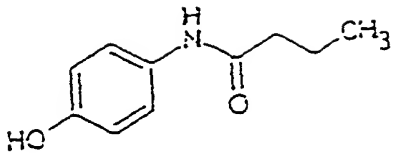
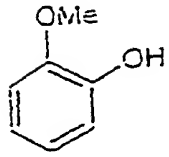
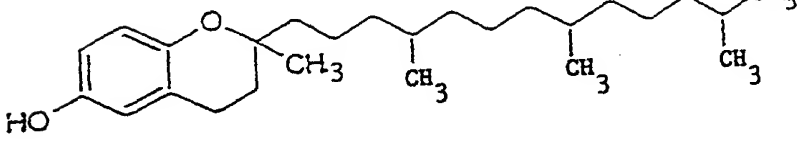


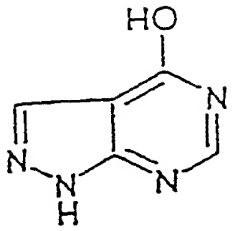
(EXXV)



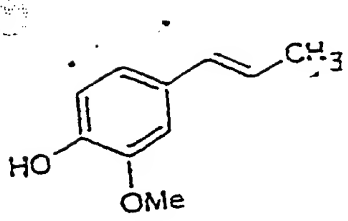
(EXXVI)



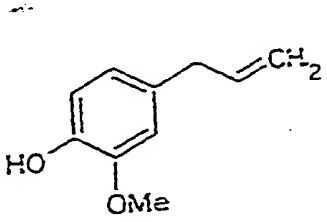
(EXXVII)



(EXXXI)



(EXXVIII)



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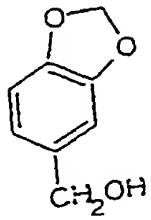
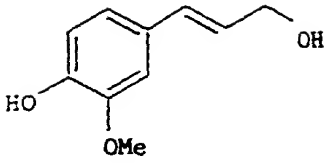


(EXXX)



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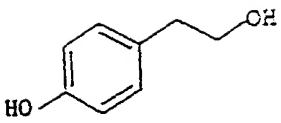
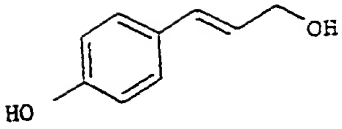
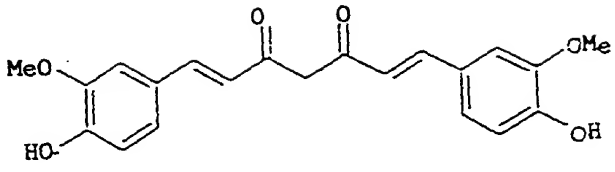


(EXXXIII)

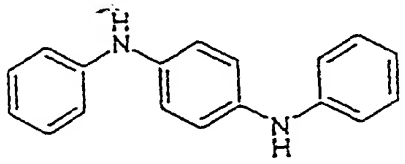


(EXXXIV)

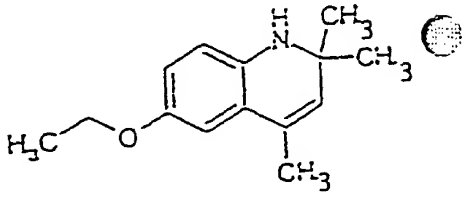


(EXXXV)

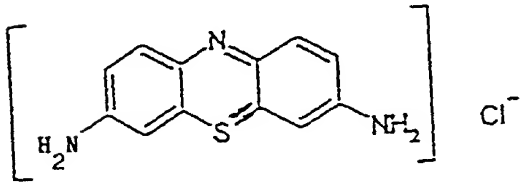
aromatic and heterocyclic amines, selected from the following: N, N'-diphenyl-p-phenylenediamine (MI), ethoxyquin (MII), thionine (MIII), hydroxyurea (M-IV):



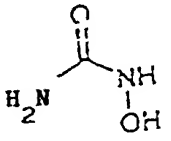
(MI)



(MII)

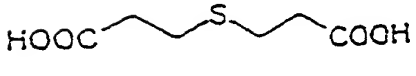


(MIII)

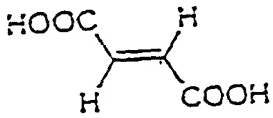


(MIV)

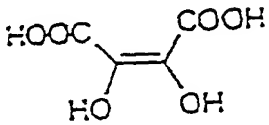
Compounds containing at least a free acid function, selected from the following: 3,3'-thiodipropionic acid (NI), fumaric acid (NII), dihydroxymaleic acid (NIII), thioctic acid (NIV), edetic acid (NV), bilirubin (NVI), 3,4-methylendioxycinnamic acid (NVI-I), piperonylic acid (NVIII):



(NI)

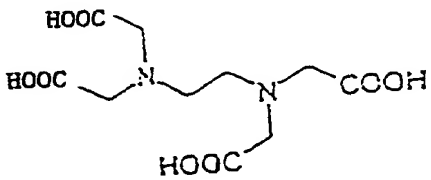


(NII)

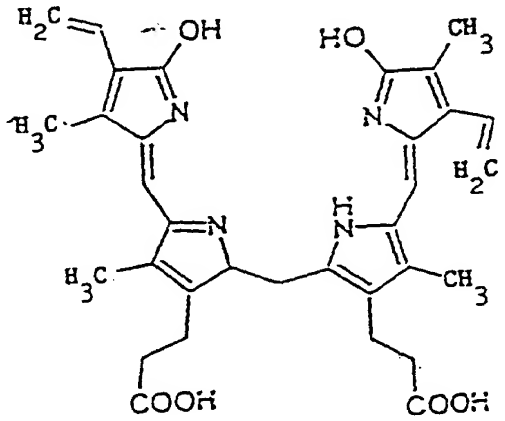


(NIII)

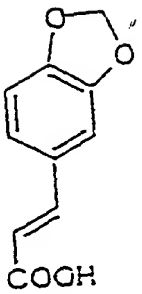
(NIV)



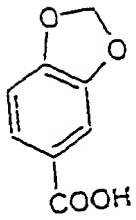
(NV)



(NVI)



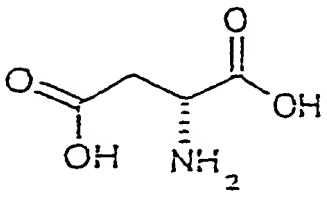
(NVII)



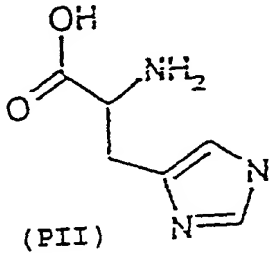
(NVIII)

3. Compounds according to claim 1 wherein the precursor compound of B or B_1 meeting test 5 is selected from the following:

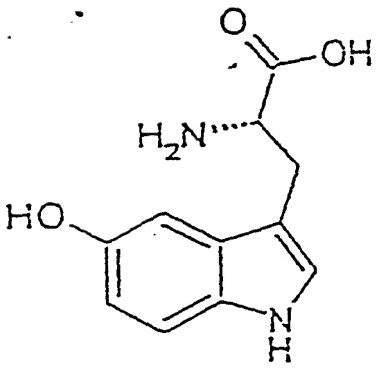
- Aminoacids: aspartic acid (PI), histidine (PII), 5-hydroxytryptophan (PIII), 4-thiazolidincarboxylic acid (PIV), 2-oxo-4-thiazolidincarboxylic acid (PV)



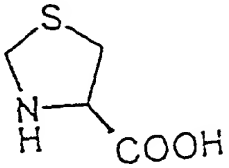
(PI)



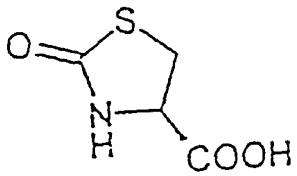
(PII)



(PIII)

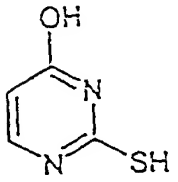


(PIV)



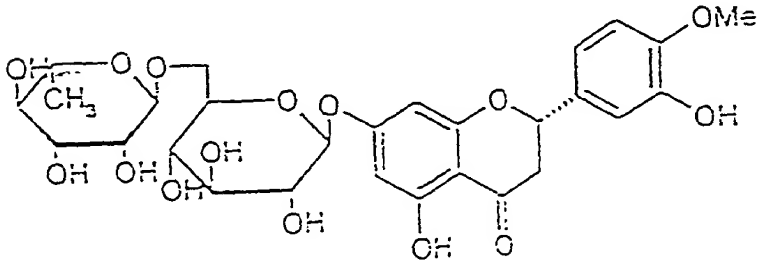
(PV)

mono and polyalcohols or thiols: 2-thiouracil (QI), 2-mercaptoethanol (QII), esperidine (QIII), secalciferol (QIV), 1-α-OH vitamin D2 (QV), flocalcitriol (QVI), 22-oxacalcitriol (QVII), the vitamin D3 derivative esterified with the vitamin A radical (QVIII), the formula (QIX) compound, 24,28-methylene-1α-hydroxyvitamin D2 (QX) the compound derived from 1α,25-dehydroxyvitamin D2 (QXI), 2-mercaptoimidazol (QXII)

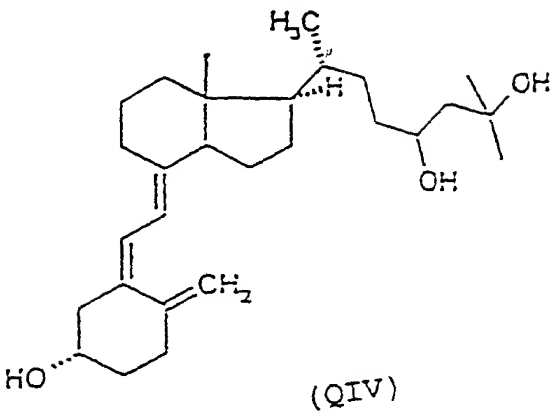


(QI)

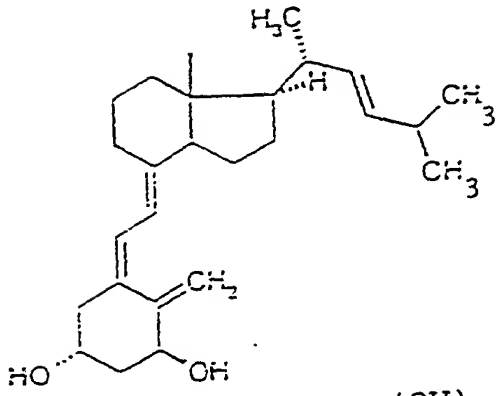
(QII)



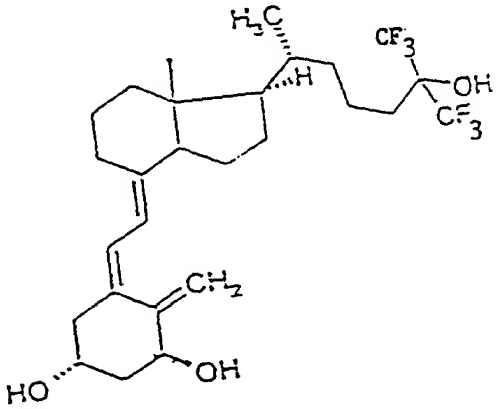
(QIII)



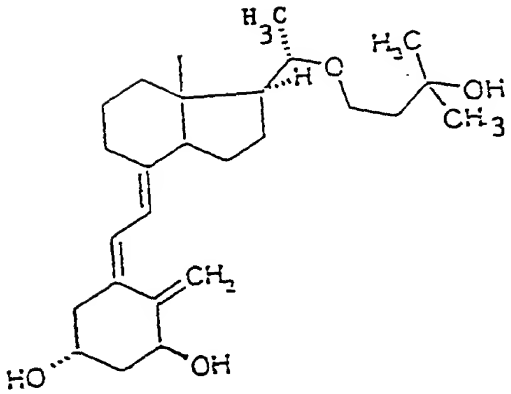
(QIV)



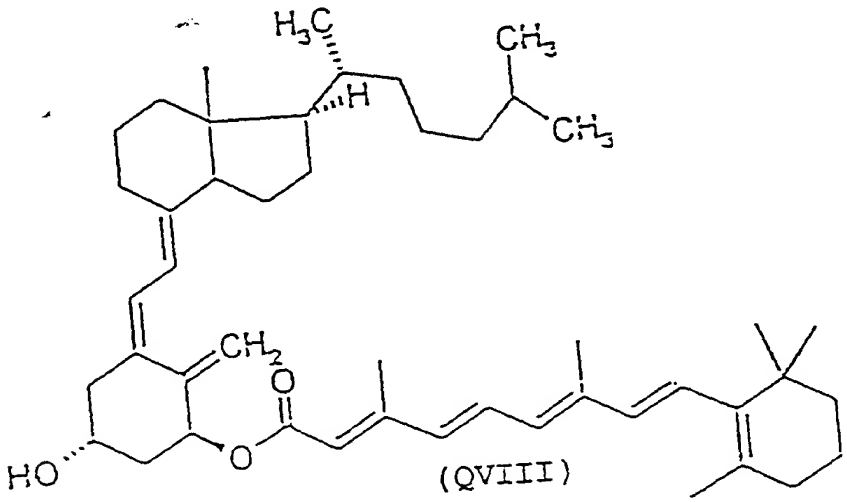
(QV)



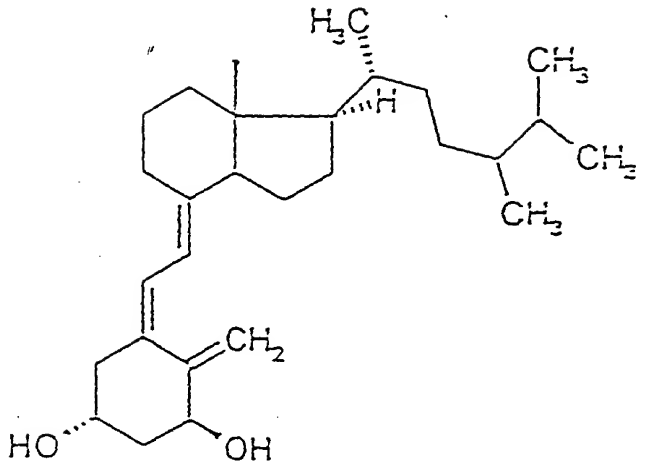
(QVI)



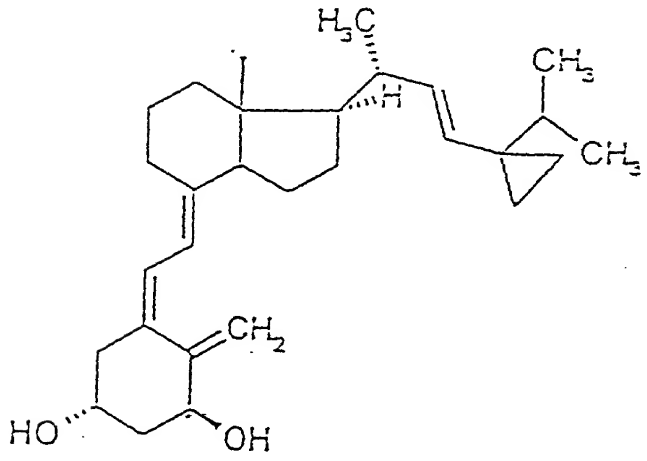
(QVII)



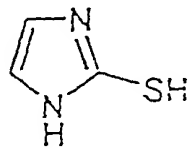
(QVIII)



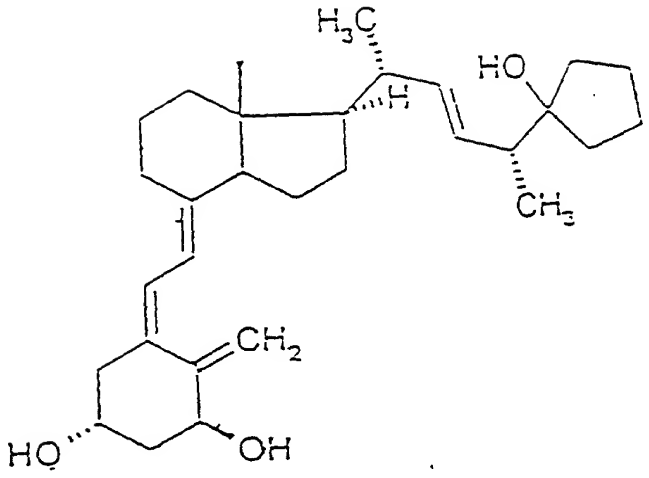
(QIX)



(QX)

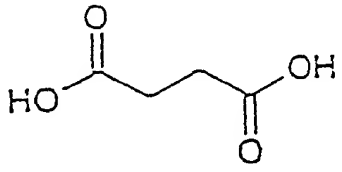


(QXII)



(QXI)

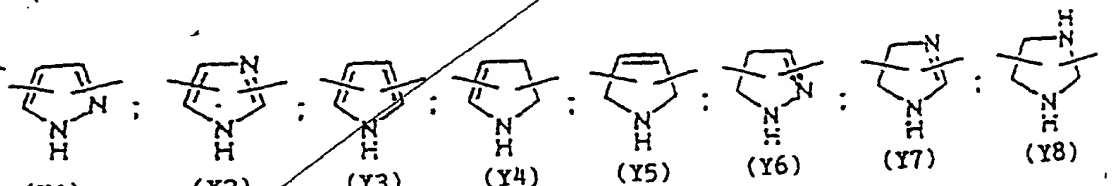
- succinic acid (RI)



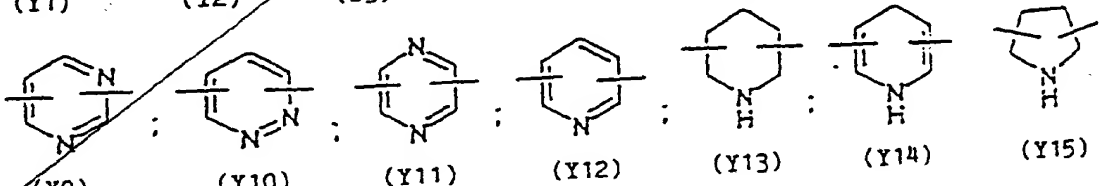
(RI)

4. Compounds according to claims 1-2 wherein the precursors of B and B_1 are those meeting test 4.

5. Compounds according to claims 1-4 wherein Y^3 in formula (III) is selected from the following:



(Y1) (Y2) (Y3) (Y4) (Y5) (Y6) (Y7) (Y8)



(Y9) (Y10) (Y11) (Y12) (Y13) (Y14) (Y15)

6. Compounds according to claim 5 wherein Y^3 is Y12 (pyridyl)

substituted in positions 2 and 6.

7. Compounds according to claims 1-6 wherein in the precursor steroids R" = $-CO-CH_2OH$, $-CH(CH_3)-CH_2-CH_2-COOH$.

8. Compounds according to claims 1-7 wherein in the precursor steroids the hydroxyl function is in position 3 and/or in position 11, and/or having in R" an hydroxyl or carboxylic function in terminal position.

9. Compounds according to claims 1-8, wherein the precursor steroids are selected from the following: Budesonide, Hydrocortisone, Alclomethasone, Algestone, Beclomethasone, Betamethasone, Chloroprednisone, Clobetasol, Clobetasone, Clocortolone, Cloprednol, Cortisone, Corticosterone, Deflazacort, Desonide, Desoximethasone, Dexamethasone, Diflorasone Diflucortolone, Difluprednate, Fluazacort, Flucloronide, Flumethasone, Flunisolide, Fluocinolone Acetonide, Fluocinonide, Fluocortyn Butyl, Fluocortolone, Fluorometholone, Fluperolone Acetate, Fluprednidene Acetate, Fluprednisolone, Flurandrenolide, Formocortal, Halcinonide, Halobetasol Propionate, Halomethasone, Halopredone Acetate, Hydrocortamate, Loteprednol Etabonate, Medrysone, Meprednisone, Methylprednisolone, Momethasone Furoate, Paramethasone, Prednicarbate, Prednisolone, Prednisolone 25-Diethylaminoacetate, Prednisolone Sodium Phosphate, Prednisone, Prednival, Prednylidene, Rimexolone, Triamcinolone, Triamcinolone

Acetonide, 21-Acetoxypregnenolone, Cortivazol, Amcinonide, Fluticasone Propionate, Mazipredone, Tixocortol, Triamcinolone Hexacetonide, Ursodesoxycholic acid, Chenodeoxycholic acid, Mitatrienediol, Moxestrol, Ethynylestradiol, Estradiol, Mestranol.

10. Compounds or salts, or their compositions according to claims 1-9 for use as a medicament; provided that in the compounds of formula (I) are excluded the drugs with A = R- when $b_0 = 0$ and $C = -T_c-Y_0-$ wherein the free valence of Y_0 is saturated as indicated above, and s = 1 or 2.

11. Use of the compounds or salts, or their compositions according to claims 1-9 for the preparation of drugs for the therapeutic stress oxidative use; in the compounds of formula (I) when $b_0 = 0$ and $C = -T_c-Y_0$ wherein the free valence of Y_0 is saturated as indicated above, s = 1 or 2, the drug can be A = R-.

12. Pharmaceutical formulations containing as active principle the compounds or their salts of claims 1-9.